

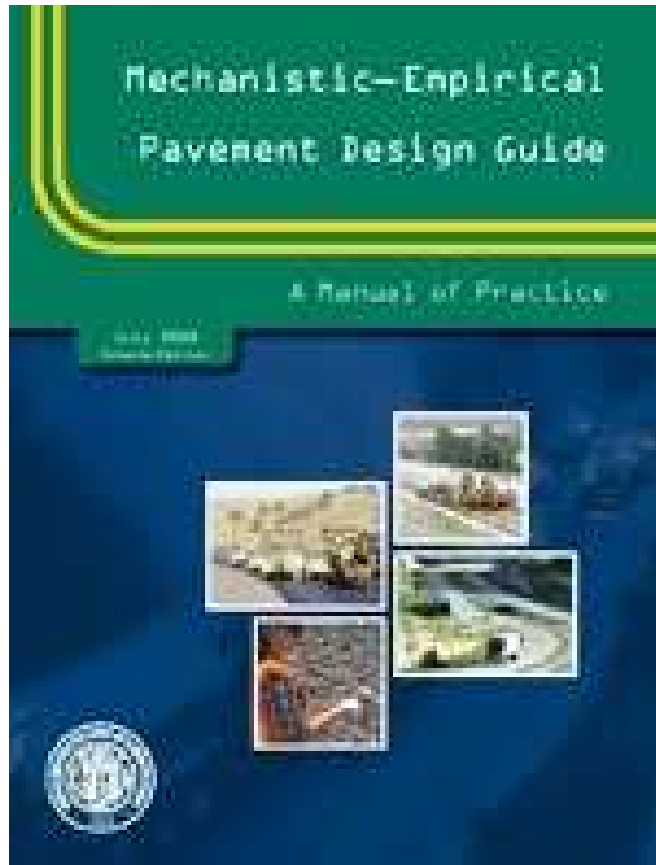
Moving Forward with DARWin- ME™

By Judith Corley-Lay

You are a pavement professional.



You work in a state that participated in the development of MEPDG and DARWin-ME.



You don't understand how using DARWin-ME will change pavement design.



You want to understand the changes that
may result from using DARWin-ME.



Understand the components of DARWin-ME to understand NCDOT implementation efforts.



The new software has more complex inputs in the areas of Traffic, materials, and climate.

Research work at NC State University provided guidance on traffic inputs.




[illegible]

AXLES PER TRUCK

Research work at NC State also provided guidance on some materials properties.

HMA Materials Input Screen





Layer:

| | |
|--|--|
| Asphalt | |
| Thickness (mm) | <input checked="" type="checkbox"/> 250 |
| Unit weight (kg/m ³) | <input checked="" type="checkbox"/> 2300 |
| Poisson's ratio | 0.35 |
| Dynamic Modulus | |
| Dynamic modulus | Analysis level:3 |
| Asphalt Binder | |
| Asphalt binder | Conventional Viscosity:AC 20 |
| General | |
| Reference temperature (deg C) | <input checked="" type="checkbox"/> 21.1 |
| Effective binder content (%) | <input checked="" type="checkbox"/> 11.6 |
| Air voids (%) | <input checked="" type="checkbox"/> 7 |
| Thermal conductivity (watt/meter-kelvin) | <input checked="" type="checkbox"/> 1.16 |
| Heat capacity (joule/kg-kelvin) | <input checked="" type="checkbox"/> 963 |
| Identifiers | |
| Display name/identifier | Default asphalt concrete |
| Description of object | |
| Author | |
| Date created | 9/16/2010 |
| Approver | |

Materials Input- Non Stabilized Base and Subgrade

Layer: ▼ Output Report

| | |
|--|--|
| Unbound | |
| Layer thickness (mm) | <input type="checkbox"/> Semi-infinite |
| Poisson's ratio | <input checked="" type="checkbox"/> 0.35 |
| Coefficient of lateral earth pressure (k0) | <input checked="" type="checkbox"/> 0.5 |
| Modulus | |
| Resilient modulus (MPa) | 166 |
| Sieve | |
| Gradation & other engineering properties | A-2-7 |
| Soil Water Characteristic Curve | User defined |
| Degree of saturation | 0 |
| Identifiers | |
| Display name/identifier | A-2-7 |
| Description of object | Default material |
| Author | AASHTO |
| Date created | 1/1/2011 |
| Approver | |
| Date approved | 1/1/2011 |
| State | |
| District | |

Early issues with climate files were solved by using 10 years of complete climate records per climate station.

The ten-year climate file is repeated over and over to make up the analysis period.

Issue if one or two years are non-typical. Error of 10-20% is repeated over and over.

NCDOT will need to have longer climate records developed to overcome this issue.

NCDOT is using the software now on some major projects, but having to adjust failure criteria to get reasonable results.

Failure Criteria

Project 102-F

General Information

Analysis type: New Pavement

Pavement type: Jointed Plain Concrete Pavement(JPCP)

Design life (years): 7

Base construction: August 2006

Pavement construction: September 2006

Traffic opening: October 2006

☐ Use special traffic loading for flexible analyses.

Add Layer Remove Up Down

[Click here to edit PCC-PCC over stabilized base](#)

[Click here to edit Stabilized Base](#)

[Click here to edit Subgrade](#)

[Click here to edit Subgrade](#)

| Use | Analysis | Limit | Reliability |
|-------------------------------------|--------------|-------|-------------|
| <input checked="" type="checkbox"/> | initial IRI | 63 | |
| <input checked="" type="checkbox"/> | terminal IRI | 172 | 90 |
| <input checked="" type="checkbox"/> | cracking PCC | 15 | 90 |
| <input checked="" type="checkbox"/> | faulting | 0.12 | 90 |

Layer: Layer CSB:

☒ **Chemically Stabilized**

Layer thickness(in): ☒ 4

Unit weight (pcf): ☒ 150

Poisson's ratio: ☒ 0.2

☒ **Strength**

Elastic/resilient modulus (psi): ☒ 1000000

☒ **Thermal**

Thermal conductivity (BTU/hr-ft-F): ☒ 1.25

Heat capacity (BTU/lb-F): ☒ 0.28

☒ **Identifiers**

Layer thickness(in):

Thickness of the chemically stabilized base

Minimum: 4

Maximum: 24

Failure criteria for flexible pavements include IRI, top down cracking, bottom up cracking and temperature cracking.

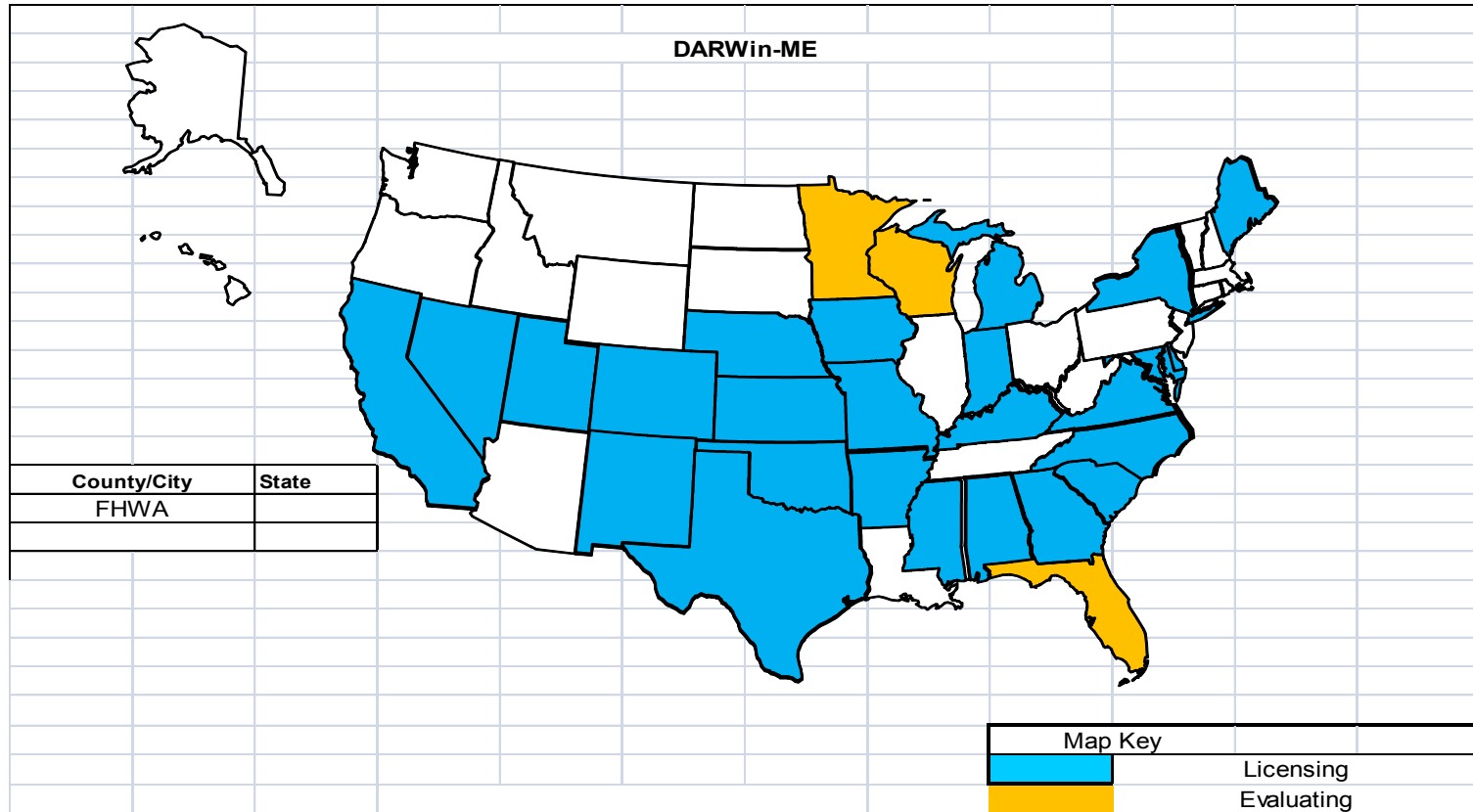
NCDOT wants to limit bottom up cracking to 10% of wheelpath.

NCDOT wants to limit top down cracking to 1000' per mile in the design lane.

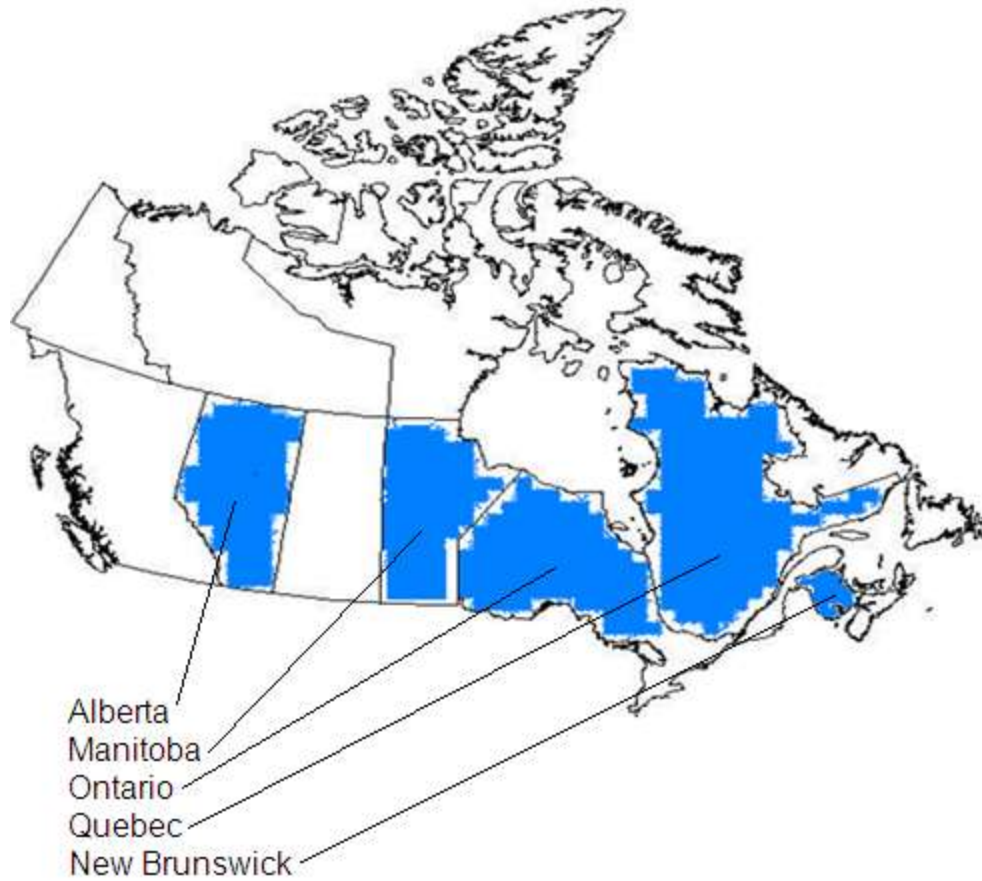
The temperature cracking in DARWin-ME is cold temperature cracking, which NC has in only a few western counties like Graham and Cherokee Counties.

NCDOT is making progress on DARWin-ME implementation using research findings and by modifying the failure criteria. Additional work will be ongoing.

Licensee Map for 2012 DARWin-ME in USA



Licensee Map 2012-Canada



Thank you for your attention.

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